

MEMORANDUM

TO: Air District Emission Inventory Staff

FROM: Patrick Gaffney, ARB

DATE: October 1, 2003

SUBJECT: **Updating Livestock Emissions for California**

Overview: Over the past several years, ARB staff has been working to develop methods for estimating livestock emissions in California. Previously, we have deferred updating the livestock emission estimates due to limited emission factor data, and sometimes outdated or inconsistent population data. Unfortunately, although these problems still exist, we must provide emission estimates now to meet scientific as well as policy needs.

ARB has generated livestock emission estimates for dairy cattle, beef cattle, feedlot cattle, broiler chickens, layer chickens, turkeys, swine, goats, sheep, and horses. When sent to the air district for an initial review, some problems were identified. One of the problems, based on splitting county emissions to air basins and districts, has been corrected. A more complicated issue is dealing with inconsistencies between the ARB population estimates and what may be available from local agricultural commissioners.

Initially, the ARB was going to work with each district to individually refine their population estimates. This has turned out to be infeasible and technically unsound. Therefore, we now plan to update the emission inventory with ARB's current livestock estimates. Then, districts may individually update their population (and emission factor) data as desired. *But, before making any changes, please read the items below regarding the population estimates.*

With both the public and political pressure to better understand livestock emissions, the ARB is committed to improving the shortcomings in the current livestock emission estimates. Unfortunately, with pending CCOS atmospheric modeling and other needs, we must add these data to the database now. If you do make any changes to your data, please maintain documentation on the source and vintage of your updated information.

**Beef and Dairy
Cattle
Population
Estimates**

If you are considering updating your population emission estimates for beef or dairy animals, please read this section.

Estimating the beef and dairy cattle population in California is much more difficult than it sounds.

Baseline Population – Addressing the simplest issue first, several air districts checked with their agricultural commissioners to confirm beef and dairy cattle population numbers. In most cases, they found that the ARB numbers were significantly higher than the agricultural commissioner numbers. In general, this is because the agricultural commissioners only provide estimates for producing stock. They do not include estimates for all of the support stock, which includes heifers, bulls, and calves.

Referring to Table 2 in ARB's draft livestock methodology, under Dairy Cattle, the Cows column is what most agricultural commissioners will provide for dairy population. Under the Range Cattle, again the Cows column is what is typically provided for the Beef population. Note that there are many other animal classes listed, in addition to the beef and dairy cows.

So, where do all of those other animals come from and how do we know how many there are? In their annual Agricultural Resource Directory, the California Department of Food and Agriculture (CDFA) publishes county totals of All Cattle, Beef Cows, and Milk Cows for the year 2000. As an example, for the year 2001 in the Sacramento Valley counties, the population for All Cattle = 332,000, Beef Cows = 106,000, and Milk Cows = 45,000. So, this means that there are 181,000 cattle in the Sacramento Valley that are not included in the agricultural commissioner's production population estimates (i.e., $332,000 - (106,000 + 45,000)$).

A copy of the CDFA table is attached. The full document is available for download as a 3.1 mb pdf file at:
http://www.cdfa.ca.gov/card/card_new02.htm
The beef and dairy county information is on pages 122 and 123.

So, before changing cattle population estimates, please insure that your updated estimates include support stock.

Allocating Populations – Using the example above, we have nearly 200,000 head in the Sacramento Valley that are not assigned to any specific population category. What do we do with them? This is the very complicated part of the methodology, and I am only able to fully grasp it for a few minutes at a time. Using data in the CDFA report, knowledge

about animal husbandry practices, various ratios, and a little hocus-pocus, we subdivide the remaining animals into separate industry-specific categories.

For example, part of the residual population is assigned to the dairy industry as bulls, pregnant heifers, young heifers, and calves (in addition the cows already counted). There are similar categories for beef. The details of this, if you dare, are documented in our population methodology. This write-up still needs some significant work though until it is reasonably comprehensible.

We're trying to think of ways to simplify all of this, but for the future we want to apply different emission factors to the different cattle types, which is one reason why we maintain several animal categories.

Poultry and Other Livestock Populations

If you are considering updating your population emission estimates for poultry and other livestock, please read this section.

Several districts reported that the ARB estimates for poultry appear to be incorrect. In some cases this is probably true. There are several reasons for this:

- 1) The last time that *county-specific* poultry population data was compiled for the entire state was 1997, which is what we are using to allocate the county emissions. Therefore, if there have been specific closures between then and now, they will not be reflected. The next update year for the USDA state/county census is 2002, with data products available in mid-2004.
- 2) For confidentiality reasons, numerous counties do not report their poultry populations. For example, the statewide total population of marketed broiler chickens in 1997 is 34.8 million. But, the total population of broilers attributed to specific counties is only 15.5 million. This means that there are over 15 million broilers hanging out somewhere in the various counties that did not report their populations. Of course, we cannot just ignore this many birds, so we evenly allocated the remaining birds to the counties withholding their population data. Obviously this approach does not effectively account for the actual county populations, but those birds need to go somewhere.

With that said, if you know that counties in your district no longer have poultry operations, please feel free to zero out the emissions and population. It is possible that our data is either outdated, or animals got allocated to your region that don't belong there.

Other Livestock – As with the poultry, the most recent county specific population data is for 1997. These 1997 data were then grown to 2000 data by using the ratio of statewide populations in 1997 versus 2000. This was done for poultry, swine, horses, goats, and sheep. The other livestock also sometimes have county populations withheld for confidentiality, but it isn't nearly as rampant as with poultry.

References

The ARB's draft livestock emission inventory and population methodologies are located here.

<http://www.arb.ca.gov/emisinv/areasrc/areameth.htm>

The statewide CDFA livestock population data for 2000 is in their annual report (pages 105-121). This report also provides county-specific information for beef and dairy cattle (but not for the other livestock types).

http://www.cdfa.ca.gov/card/card_new02.htm

USDA livestock census data for 1997 is located at the link below. This county-specific information was used for the poultry, goat, sheep, horse, and swine emissions. (Data also available in a spreadsheet from ARB.)

<http://www.nass.usda.gov/census/>

Contact:

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Web Page: http://www.cdfa.ca.gov/card/card_new02.htm

Excerpt - County Cattle Total Tables Only

2002

CALIFORNIA DEPARTMENT OF



FOOD AND AGRICULTURE

Resource Directory

California Agriculture: A Tradition of Innovation

Letter by

Governor Gray Davis

Foreword by

William (Bill) J. Lyons Jr., Secretary

Published by

California Department of Food and Agriculture

State of California

LIVESTOCK INVENTORY BY CLASS AND COUNTY, JANUARY 1, 2001–2002 ¹

County	2001			2002		
	All Cattle	Beef Cows	Milk Cows	All Cattle	Beef Cows	Milk Cows
Del Norte	7,000	1,500	—	6,000	1,000	—
Humboldt	71,000	21,000	16,800	70,000	22,000	16,700
Mendocino	29,500	12,500	—	27,000	12,000	—
District 10 Total	107,500	35,000	16,800	103,000	35,000	16,700
Shasta	46,000	24,000	—	40,000	22,000	—
Siskiyou	67,000	34,000	1,700	63,000	31,000	1,900
Trinity	5,000	3,000	—	4,000	3,000	—
District 20 Total	118,000	61,000	1,700	107,000	56,000	1,900
Lassen	51,000	26,000	—	50,000	25,000	—
Modoc	86,000	42,000	—	86,000	42,000	—
Plumas	15,000	7,000	—	14,000	6,000	—
District 30 Total	152,000	75,000	—	150,000	73,000	—
Alameda	26,000	12,000	—	28,000	12,000	—
Contra Costa	28,000	7,000	3,000	25,000	8,000	3,000
Lake	7,000	3,500	—	6,000	3,000	—
Marin	39,000	8,500	10,000	39,000	9,000	10,000
Monterey	114,000	33,000	2,000	102,000	32,000	2,200
Napa	9,000	4,000	—	8,000	4,000	—
San Benito	43,000	18,500	700	39,000	16,000	800
San Francisco	—	—	—	—	—	—
San Luis Obispo	93,000	41,000	—	90,000	39,000	—
San Mateo	3,000	2,000	—	4,000	2,000	—
Santa Clara	20,000	9,500	—	20,000	10,000	—
Santa Cruz	5,000	2,000	—	3,000	2,000	—
Sonoma	83,000	15,000	31,000	86,000	15,000	31,500
District 40 Total	470,000	156,000	46,700	450,000	152,000	47,500
Butte	19,000	8,500	1,000	17,000	7,000	800
Colusa	15,000	6,500	—	22,000	8,000	—
Glen	68,000	19,000	15,500	68,000	18,000	15,700
Sacramento	67,000	15,000	17,000	63,000	14,000	17,000
Solano	23,000	7,500	1,500	25,000	8,000	1,500
Sutter	9,000	3,000	—	9,000	3,000	—
Tehama	79,000	33,000	5,500	76,000	32,000	5,500
Yolo	16,000	6,500	1,800	19,000	8,000	2,000
Yuba	36,000	7,000	3,500	36,000	6,000	3,500
District 50 Total	332,000	106,000	45,800	335,000	104,000	46,000
Fresno	400,000	20,000	85,000	413,000	20,000	88,000
Kern	225,000	43,000	72,000	220,000	41,000	78,000
Kings	175,000	3,000	127,000	200,000	4,000	132,000
Madera	118,000	16,000	45,000	128,000	16,000	48,000
Merced	409,000	31,000	212,000	428,000	32,000	221,000
San Joaquin	215,000	20,000	101,000	237,000	21,000	105,000
Stanislaus	433,000	46,000	157,000	435,000	46,000	164,000
Tulare	660,000	33,000	376,000	706,000	31,000	394,000
District 51 Total	2,635,000	212,000	1,175,000	2,767,000	211,000	1,230,000

LIVESTOCK INVENTORY BY CLASS AND COUNTY, JANUARY 1, 2001–2002 ¹ , continued						
County	2001			2002		
	All Cattle	Beef Cows	Milk Cows	All Cattle	Beef Cows	Milk Cows
Alpine	4,000	2,000	—	3,000	2,000	—
Amador	39,000	14,000	—	28,000	12,000	—
Calaveras	27,000	14,000	—	23,000	13,000	—
El Dorado	9,000	4,500	—	11,000	5,000	—
Inyo	17,000	9,500	—	14,000	8,000	—
Mariposa	23,000	9,500	—	19,000	8,000	—
Mono	7,000	3,500	—	7,000	4,000	—
Nevada	9,000	5,000	—	8,000	5,000	—
Placer	26,000	10,000	—	26,000	10,000	—
Sierra	6,000	3,000	—	7,000	3,000	—
Tuolumne	13,000	5,000	—	17,000	7,000	—
District 60 Total	180,000	80,000	—	163,000	77,000	—
Imperial	527,000	1,500	—	530,000	1,000	—
Los Angeles	14,000	6,000	—	13,000	5,000	—
Orange	6,000	1,500	—	3,000	1,000	—
Riverside	190,000	5,500	101,000	180,000	6,000	100,000
San Bernardino	296,000	3,500	153,000	277,000	3,000	153,000
San Diego	29,000	6,500	6,000	27,000	7,000	6,000
Santa Barbara	65,000	26,000	3,000	62,000	24,000	3,000
Ventura	13,000	4,500	—	13,000	5,000	—
District 80 Total	1,140,000	55,000	263,000	1,105,000	52,000	262,000
Other Counties ²	15,500	—	11,000	20,000	—	15,900
STATE	5,150,000	780,000	1,560,000	5,200,000	760,000	1,620,000

¹ Publication of livestock county estimates was reinstated in 2001.

² Combined in "Other Counties" to avoid disclosure of individual operations.